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UNITED STATES DEPARTMENT OF AGRICULTURE

# FOREST SERVICE

Region 9
Plan 4
Chippewa Nat. For. Minn.

TIMBER MAN
PLAN

## CHIPPEWA
## NATIONAL FOREST

**F.Y. 1962 through 1971**

**Region 9**

**U. S. Department of Agriculture**

**Forest Service**

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# TIMBER MANAGEMENT PLAN

## CHIPPEWA NATIONAL FOREST

FY 1962 through 1971

Region 9

U. S. Department of Agriculture

Forest Service

TIMBER MANAGEMENT PLAN

CHIPPEWA NATIONAL FOREST

FY 1962 through 1971

Submitted by: Harold D. Westerberg — Forester, T.M. — 1/19/62 Date

Approved: John Van Barga — Forest Supervisor — 1/19/62 Date

Approved: M M Nelson — Regional Forester — 1/29/62 Date

Approved: Clare Hendee — Chief, Forest Service — 4-20-62 Date

W.D. Riffer M.D. Coordinator

## FOREWORD

This timber management plan was prepared on the basis of a re-inventory of the forest made from November, 1959, through January, 1961. Aerial photographs were taken in the summer of 1959. Data was gathered under the direction of Supervisor John H. Von Bargen and his staff. Technical assistance was provided by Mr. P. L. Thornton and Mr. V. E. Findell of the Regional Forester's timber management staff.

In addition to the individual Working Circle plans there is a summary and basic data section for the entire Forest. Automatic data processing summaries, including stock and stand tables, are considered a part of the plan and are on file at the respective Working Circle headquarters.

The multiple use coordination requirements of this plan are provided for in the districts' multiple use management plans and in R-9 FSH 2110. The coordination statements in FSH 2110 will be placed in FSM-H 2400 within the plan period.

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE REGION 9

# CHIPPEWA NATIONAL FOREST

MINNESOTA
4th & 5th PRINCIPAL MERIDIAN
1962

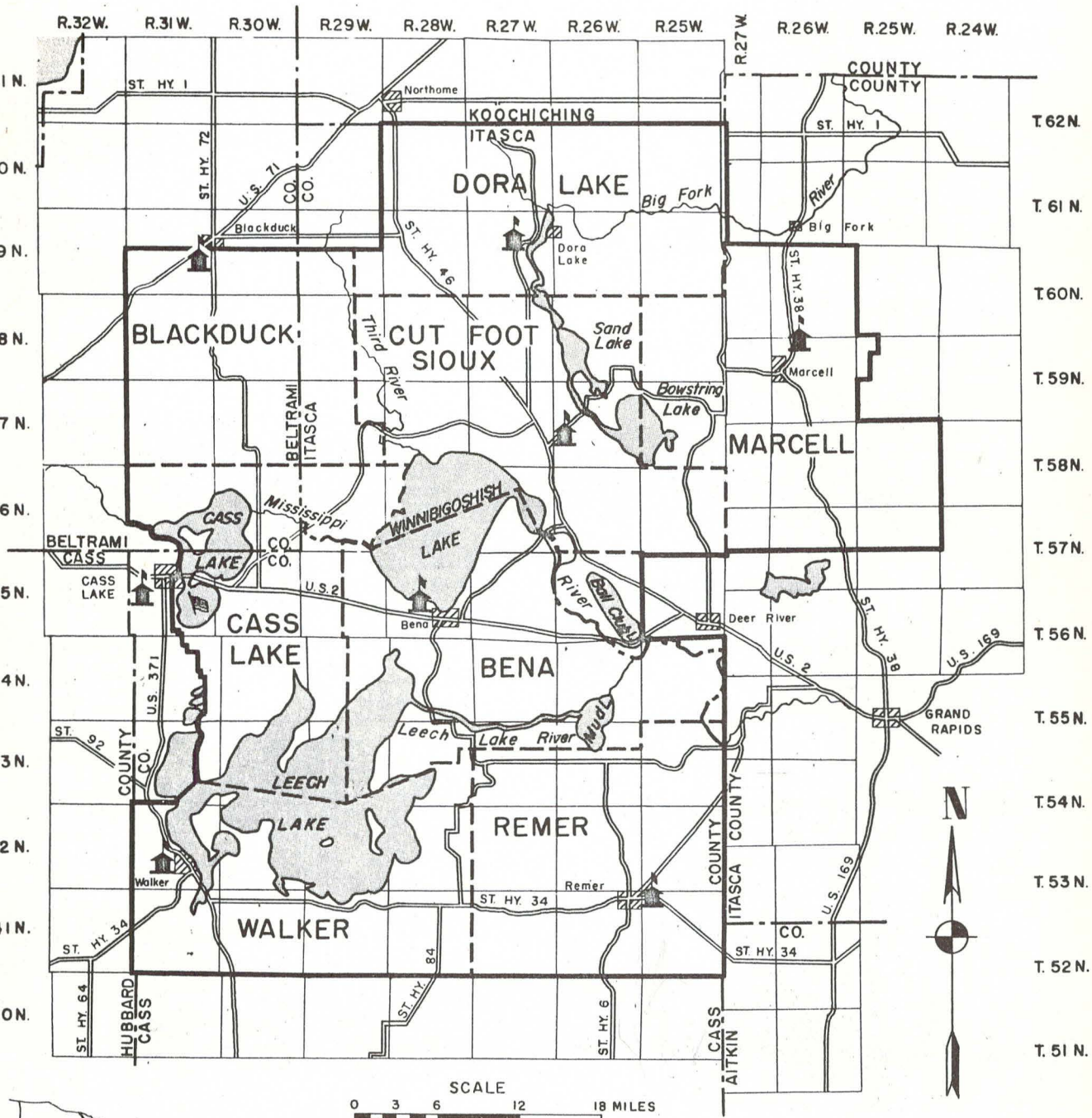


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TABLE OF CONTENTS


| | page |
|---|---|
| SUMMARY | 1 |
| BACKGROUND | |
| Location & History | 3 |
| Physiography | 3 |
| Economy | 4 |
| FOREST CONDITIONS & CHANGES | |
| Area & Timber Size Classification | 6 |
| Timber Types | 7 |
| Age Class Distribution | 9 |
| Site | 9 |
| Timber Volume | 9 |
| Changes in Growing Stock Volume | 11 |
| Growth | 12 |
| PAST TIMBER MANAGEMENT | |
| Timber Harvest | 13 |
| Planting | 13 |
| Timber Stand Improvement | 14 |
| Protection | 14 |
| PLAN OF ACTION | |
| Management Objectives | 15 |
| Coordination with Other Uses | 15 |
| Silviculture | 15 |
| Allowable Cut | 16 |
| Future Yields | 19 |
| Artificial Regeneration | 19 |
| Timber Stand Improvement | 20 |
| Transportation | 20 |
| Management Plan Controls | 21 |
| Statistical Summary | 23 |
| APPENDIX A | |
| Table 1. Total Area Summary. | |
| Table 2. Area of Timbered Commercial Forest Land by Primary and Secondary Forest Type. | |
| Table 3. Area of Timbered Commercial Forest Land by Forest Type and Age Classes. | |
| Table 4. Area of Timbered Commercial Forest Land by Forest Type and Site Index Classes. | |
| Table 5. Net Volume of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Species and Growing Stock Class. | |
| Table 6. Net Volume of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Species and Size Class. | |

Table 7. Number of Growing Stock and Cull Trees on Timbered Commercial Forest Land.
Table 8. Net Annual Growth of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Species.
Table 9. Annual Allowable Cut Area by Forest Type, Size Class, and Type of Cutting.
Table 10. Net Annual Allowable Cut of Growing Stock and Sawtimber by Forest Type, Size Class, and Type of Cutting.
Table 11. Net Annual Allowable Cut of Growing Stock and Sawtimber by Species and Type of Cutting.
Table 12. Net Annual Allowable Cut of Growing Stock by Species and Size Class of Timber.
Table 13. Area of Timbered Commercial Forest Land by Forest Type and Stand Improvement Needs.
Table 14. Total Number of Field Samples, and Total Volume and Sampling Error of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Working Circles.

APPENDIX B

General guides used to determine the allowable cut areas and volumes by types from the sample point prescription.

APPENDIX C

Working Circle Plans.

APPENDIX D

Inventory Instructions.

APPENDIX E

IBM Data Summaries

APPENDIX F

Compartment Inventory Records and Photo Maps

**SUMMARY**

Chippewa National Forest

**Area of national forest land** (July 1,1959)

| | Commercial Forest Land -Acres- | Other -Acres- | Total Land -Acres- |
|---|---|---|---|
| **Timbered** | 525,060 | 10,264 | 535,324 |
| **Nontimbered** | 45,322 | 58,806 | 104,128 |
| **Total** | 570,382 | 69,070 | 639,452 |

| | Total | | Per Acre 1/ | |
|---|---|---|---|---|
| | Growing Stock 2/ -Cords- | Sawtimber 3/ -MBM- | Growing Stock 2/ -Cords- | Sawtimber 3/ BM |
| **Net Volume** | 5,844,892 | 609,003 | 11.13 | 1,160 |
| **Net Periodic Annual Growth** | 294,407 | 43,798 | .56 | 83 |
| **Net Annual Allowable Cut** | 158,643 | 18,958 | .30 | 36 |

**Annual Allowable Cut Area:**

**Regeneration Cuts** - 10,802 **Acres**

**Intermediate Cuts** - 7,864 **Acres**

Estimated annual cut in year 2,000 - 320,000 cords

Estimated annual sustained yield - - 480,000 cords

1/ Timbered commercial forest land.
2/ All live merchantable trees 5.0" d.b.h. and larger to a variable top of not less than 4.0" d.i.b.
3/ All live merchantable trees 9.0" (softwoods), 11.0" (hardwoods) d.b.h. and larger to a variable top of not less than 8.0" d.i.b. Scribner Rule

## Volume, Growth, and Estimated Annual Cut on Allowable Cut Acres by Size and Species Groups

| Item | Conifers | | | Hardwoods | | |
|---|---|---|---|---|---|---|
| | Volume | Growth | Est. Cut | Volume | Growth | Est. Cut |
| | (M Cords of Growing Stock) | | | | | |
| Poletimber | 923.4 | | 18.9 | 3,019.9 | | 81.0 |
| Sawtimber | 1,160.0 | | 28.6 | 741.5 | | 30.3 |
| Total | 2,083.4 | 75.2 | 47.5 | 3,761.4 | 219.3 | 111.3 |
| | (MMBM of Sawtimber) | | | | | |
| Sawtimber | 372.7 | 21.3 | 9.7 | 236.3 | 22.5 | 9.3 |

## Summary by Working Circles

| District | Com. Forest Land | Growing Stock | Annual Growth | Allowable Cut | Allowable Cut: Regeneration | Allowable Cut: Intermediate |
|---|---|---|---|---|---|---|
| | -Acres- | -Cords- | -Cords- | -Cords- | -Acres- | -Acres- |
| Bena | 65,974 | 648,585 | 29,983 | 18,318 | 1,310 | 948 |
| Blackduck | 53,473 | 442,340 | 20,654 | 15,992 | 1,269 | 443 |
| Dora Lake | 74,986 | 612,668 | 38,047 | 15,426 | 1,380 | 367 |
| Cass Lake | 77,692 | 1,013,688 | 37,271 | 26,002 | 2,013 | 1,403 |
| Cut Foot Sioux | 73,244 | 1,031,554 | 38,293 | 21,303 | 970 | 1,467 |
| Marcell | 90,774 | 1,049,030 | 48,337 | 31,680 | 1,553 | 1,377 |
| Remer | 86,829 | 588,471 | 48,642 | 19,836 | 1,669 | 1,119 |
| Walker | 47,410 | 458,556 | 33,180 | 10,085 | 638 | 740 |
| Total | 570,382 | 5,844,892 | 294,407 | 158,642 | 10,802 | 7,864 |

# BACKGROUND

## Location and History

The Chippewa National Forest, located in north central Minnesota, is one of the oldest national forests in the United States. Lands for the forest were first set aside under the Act of June 27, 1902 (Morris Law). However, not until 1923 were the "Forest Reserve" lands actually put under complete control of the Forest Service.

Originally the forest was known as the Minnesota National Forest but on June 22, 1928 the name was changed to that it now bears.

When established, the forest contained 312,659 acres and included only three working circles - Cass Lake, Cut Foot Sioux and Bena. In 1933, the "North Purchase Unit", and in 1935, the "South Purchase Unit" were added to the forest. The "North" unit included the Blackduck, Dora Lake and Marcell working circles and the "South" unit the Remer and Walker working circles. The present national forest boundary encompasses some 1.3 million acres of which 639,452 acres (June, 1959) are in national forest ownership.

The first intensive inventory of the forest was made in 1948, and a timber management plan was formulated for each working circle to prescribe timber management practices and goals. These were applicable until revised in this plan. Copies of that plan are on file at the ranger's and supervisor's office and may be referred to for additional historical and background information.

## Physiography

Till plains and outwash plains containing a large number of lakes and swamps comprise most of the forest. The eastern portion is made up largely of moraines with rolling topography and clay till plains having a high water table, poor drainage and extensive swamps. The southwest portion contains rolling hills with numerous "pot-hole" lakes and swamps.

The divide between the Hudson Bay and Mississippi River drainages runs east-west through the forest.

The vegetation and timber types are excellent indicators of soil conditions. The jack pine type is found on the poorer sand soils. Here, the low vegetation is blueberry, sweet fern, wintergreen, and hazel brush. Poor aspen and birch stands are also found on these soils. On the loams and better sands, red pine is or has been the predominating type. The low vegetation here is bracken, wintergreen and hazel brush. The condition of the aspen and birch found on this soil type is much better than on the poor sand soils. On the heavier soils are found white pine, northern hardwood, and excellent aspen stands with a dense understory of shrubs.

The forest's location in the northern portion of the state and close to the large prairie areas of North Dakota bring about extremes in temperatures between winter and summer and account for the short frost-free growing season prevalent in the area. Temperatures from -59° to 106° have been recorded at official weather bureau stations in the vicinity. A continuous record over 40 years in existence shows an average growing season of approximately 115 days.

Winter freeze up usually occurs just after November 1, and lasts until March 1-15, when spring break up commences. Usually this period permits logging in any area on the forest under average conditions. Occasionally heavy snows arrive before the ground and swampy areas are frozen, making logging difficult and expensive, especially where swamp species are being cut. Average snowfall approximates 40-50 inches and total average annual precipitation is 25 inches.

## Economy

During the last few years, more and more people have become directly or indirectly dependent upon the forest for a living. Recreation use has increased greatly and the volume of timber cut has doubled in the last 10 years.

Most farmers depend to some degree on outside work to augment their farm operations. Many of them spend the winter months harvesting some form of timber product. An adequate small sale program is of great importance to them.

There has been no major wood using industrial development in the area during the past few years. Some of the fiber-using companies that have an influence on the area have expanded to some extent.

Products from the forest area are marketed in varying amounts to the following large wood-using industries:

1. Blandin Paper Co. - Grand Rapids
2. Waldorf Paper Co. - St. Paul
3. M. and O. Paper Co. - International Falls
4. St. Regis Paper Co. - Sawtell
5. Northwest Paper Co. - Cloquet
6. Various Wisconsin pulp mills

The Wheeler Bridge and Lumber Company, which constructed a post plant at Cass Lake during the previous plan period, has expanded a great deal. In addition to pine posts, they now take large quantities of pine poles and piling for finishing and preservative treatment. This company has become the major industry in the Cass Lake area.

The previous timber management plan predicted a large surplus of aspen. As the figures in this plan testify, this is definitely the case. The lack of markets for the allowable aspen cut is the greatest drawback to intensive timber management on the Chippewa National Forest.

Pine products are generally marketable now, both for roundwood and sawtimber. The small volume of quality hardwoods can be marketed but there is a surplus of low grade material.

## FOREST CONDITIONS AND CHANGES

### Area and Timber Size Classification

Of the 639,452 acres of national forest land, 570,382 acres are classified as commercial forest land - that is - land which is producing or capable of producing crops of industrial wood and is not withdrawn from timber utilization. Eight percent of the commercial forest land or 45,322 acres is presently nonstocked. This compares with about 95,000 acres classed as nonstocked in 1948.

There was a considerable change in timber size class distribution on the stocked commercial forest land (Fig. 1). Poletimber stands, which in 1948 occupied only 38 percent of the commercial forest, now occupy 67 percent. Sawtimber stands likewise increased from 6 percent to 16 percent. On the other hand, seedling and sapling stands decreased from 38 percent in 1948 to only 9 percent in 1960. Most of the increase in poletimber and decrease in restocking area occurred in the aspen type.

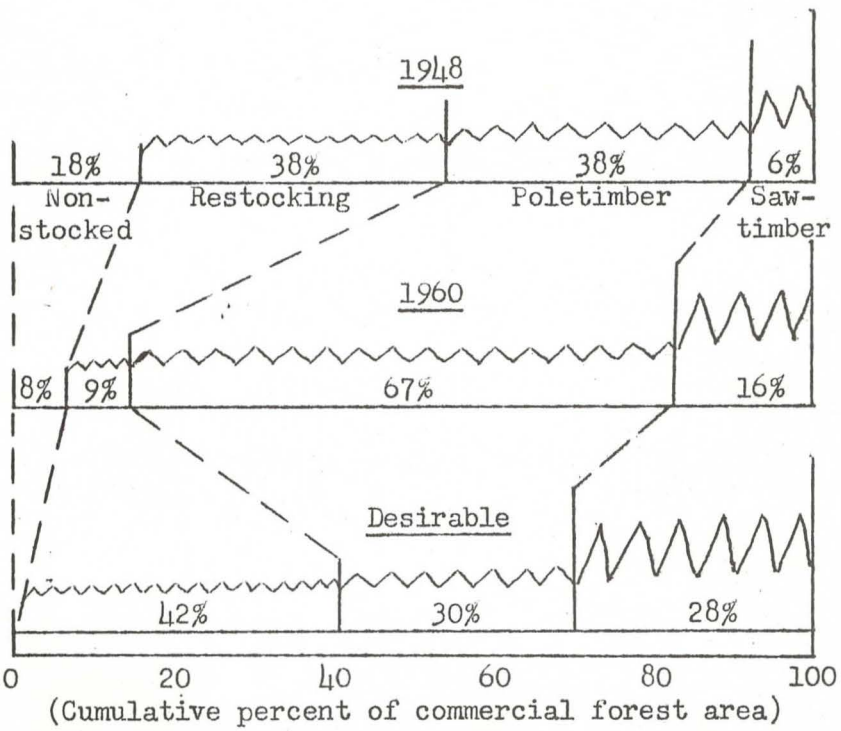


Fig. 1. Comparison of Past, Present, and Desirable 1/ Distribution of Size Classes.

1/ Based on present type acreages and recommended rotations.

The size class distribution is better now than at the time of the previous inventory, but there is still a long way to go to achieve a regulated condition for sustained yield management. Efforts must be continued to restock non-stocked forest land. The area in pole-timber should be reduced and that in reproduction and sawtimber should be increased.

Timber Types

Aspen and birch types still dominate the forest (Fig. 2 and Table 1 Appendix): The transition to the long-lived species and permanent types is discouragingly slow. In fact, the so called "temporary" aspen types increased more than any other. There has been little betterment in forest type distribution other than the reduction in non-stocked area.

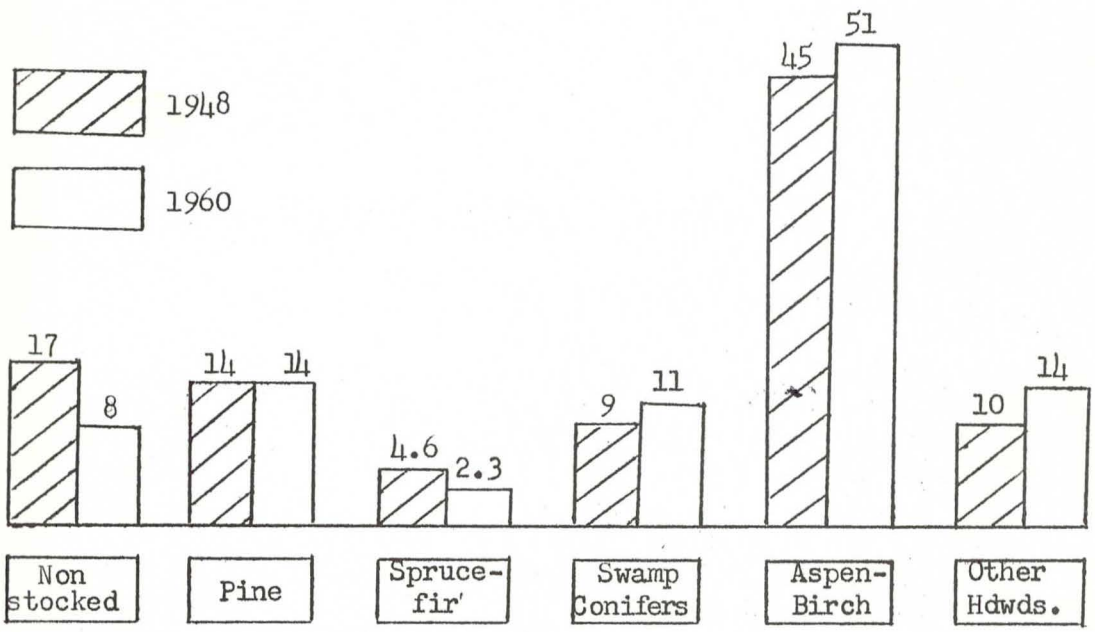


Fig. 2. Distribution of Commercial Forest Land by Types in 1948 and 1960 (percent).

The most formidable management problem is to utilize the existing types fully and establish more desirable species on the forest, particularly pine. The following tabulation shows the percentage change and the change in acreage within the various forest types for the 12-year period between inventories:

| Forest Type | Change (acres) | Change (percent) |
|---|---|---|
| SOFTWOODS: | | |
| White Pine | + 1,216 | + 18 |
| Red Pine | + 9,897 | + 29 |
| Jack Pine | - 6,733 | - 19 |
| Spruce-fir | - 12,546 | - 49 |
| Swamp Conifers | + 12,025 | + 26 |
| HARDWOODS: | | |
| Northern Hardwoods | + 18,468 | + 49 |
| Oak | + 3,075 | + 83 |
| Lowland Hardwoods | + 3,902 | + 28 |
| Aspen-Birch | + 39,815 | + 16 |
| Non-timbered | - 50,037 | - 52 |

One desirable change of importance is the increase in the red pine type by almost 10,000 acres due primarily to planting of this species. At the same time, however, jack pine area decreased almost 7,000 acres. Some of this loss in acreage was the result of forced conversion by planting to red pine and resulted in a net gain to the forest. But, at the same time some natural conversion has been to less desirable types because of difficulty in natural regeneration of jack pine.

Some indication of the future trend in type conversion can be gained by analyzing the secondary type classification (Table 2 Appendix). One of the outstanding features is the large acreage of aspen with a spruce-fir understory. This indicates the acreage of spruce-fir will increase in the future as the aspen is harvested or passes its pathological rotation. This trend should be aided through management.

Another feature is the large area with an aspen or paper birch secondary type. This trend must be countered through intensive management measures, especially in the desirable red and jack pine types. All primary red and jack pine types must be regenerated to pine at rotation age and must not be allowed to convert to aspen. There is a considerable area of aspen with pine understory which can and must be converted to pine through judicious management measures.

## Age Class Distribution

The red and jack pine types contain a relatively good distribution of age classes (Table 2 Appendix). This is reflected in the allowable regeneration cut acreages which are only slightly less than the theoretical acreage obtained in a fully regulated forest. Most of the other even-age types have age class distributions which require no drastic deviations from normal cutting except for aspen.

Over 2/3 of the aspen is from 26 to 45 years of age, the most productive stage in the rotation in terms of volume production. This shows up in the high average growth rate for the forest. Over 56,000 acres are already rotation age or older. A heavy cut is needed in aspen if the highest volume production is to be attained from the type.

## Site

The tabulation below shows the area of selected types by three broad site quality classes:

| Forest Type | Below Average (acres) | Average (acres) | Above Average (acres) |
|---|---|---|---|
| Red Pine | 110 | 14,060 | 30,300 |
| Jack Pine | 360 | 440 | 27,780 |
| Aspen | 560 | 87,260 | 187,000 |

Sites are generally above average for the upland conifer and aspen types (Table 4 Appendix). Some of the best aspen stands in the Lake States are found on the forest. They are well stocked, of high quality, and have very good growth on these good and better sites. The other hardwood types are generally of low quality, although the northern hardwood sites are above average for conifers. Swamp conifers grow on a wide range of sites. Some are so low in productivity they are classed as non-commercial land.

## Timber Volume

The Chippewa National Forest contains 5,844,892 cords of wood in all merchantable trees to a minimum top d.i.b. of 4 inches (growing stock). Forty-six percent of this volume is in trees classified as good growing stock, 1/ 15 percent in poor growing stock 1/ and the remaining 39 percent is in harvest 1/ class trees (Table 5 Appendix). The total sawtimber volume of 609 million board feet (Scribner) is divided as follows: 37 percent good growing stock, 5 percent poor growing stock and 58 percent harvest. The only species with less than one-half their

1/ Definitions are in the survey instructions, Appendix D.

sawtimber volume in harvest class trees are red and jack pine. Generally, the larger trees of all other species are of poor quality or thrift.

Most of the growing stock volume is in hardwoods, primarily aspen (Table 1), but the bulk of the sawtimber volume is in conifers.

Table 1. Volume of Growing Stock and Sawtimber in Hardwoods and Conifers by Tree Size Class.

| Tree Size | Growing Stock | | | | Sawtimber | | | |
|---|---|---|---|---|---|---|---|---|
| | Softwoods | | Hardwoods | | Softwoods | | Hardwoods | |
| | (M Cds) | (%) | (M Cds) | (%) | (MMBM) | (%) | (MMBM) | (%) |
| Poles | 923 | 44 | 3,020 | 80 | - | - | - | - |
| Small sawtimber | 768 | 37 | 590 | 16 | 204 | 55 | 179 | 76 |
| Large sawtimber | 392 | 19 | 152 | 4 | 168 | 45 | 58 | 24 |
| Total | 2,083 | 100 | 3,762 | 100 | 372 | 100 | 237 | 100 |

Sixty-eight percent of the total volume of growing stock is in pole-size trees and only 9 percent in large sawtimber trees or trees 15 inches d.b.h. and larger (Table 6 Appendix).

Almost all of the sawtimber size trees of some species are actually marketed as cordwood so the sawtimber volume as given does not measure practical sawtimber. Jack pine, balsam fir, spruce, tamarack, aspen, balsam poplar and paper birch are largely marketed as cordwood. These species make up 244,654 MBM of the sawtimber volume. So the practical sawlog volume is 364,349 MBM compared to the potential volume of 609,003 MBM.

Red pine makes up slightly over 10 percent of the total growing stock, but 30 percent of the total sawtimber volume on the forest and 50 percent of the "practical" sawlog volume. This species also has the highest proportion of its total volume in good growing stock.

Cull trees make up 13 percent of the total number of trees. Eight percent of the softwoods and 15 percent of the hardwoods are culls (Table 7 Appendix).

Changes in Growing Stock Volume

Between 1948 and 1960 growing stock volume increased 46 percent or almost 2 million cords (Table 2 and Fig. 3).

Table 2. Growing Stock Volume in 1948 and 1960 by Species and Species Groups.

| Species | 1948 | 1960 | Change |
|---|---|---|---|
| | | -M Cords- | |
| White Pine | 317 | 236 | - 81 |
| Red Pine | 551 | 597 | + 46 |
| Jack Pine | 309 | 339 | + 30 |
| Balsam Fir | 290 | 458 | + 168 |
| Spruce | 214 | 214 | 0 |
| Cedar and Tamarack | 222 | 239 | + 17 |
| All softwoods | 1,903 | 2,083 | + 180 |
| Northern Hardwoods 1/ | 154 | 328 | + 174 |
| Aspen | 1,043 | 2,158 | + 1,115 |
| Paper Birch | 388 | 592 | + 204 |
| Other Hardwoods | 506 | 684 | + 178 |
| All hardwoods | 2,091 | 3,762 | + 1,671 |
| TOTAL | 3,994 | 5,845 | + 1,851 |

The average acre of timbered commercial forest land contained 8.8 cords in 1948 and now contains 11.1 cords. Per acre volume did not increase proportionately to total volume because of the increase in forested acres. Aspen and northern hardwoods more than doubled their volumes but conifers increased very little. Balsam fir accounted for most of the increase in conifer volume. White pine decreased drastically.

1/ Sugar maple, yellow birch and basswood.

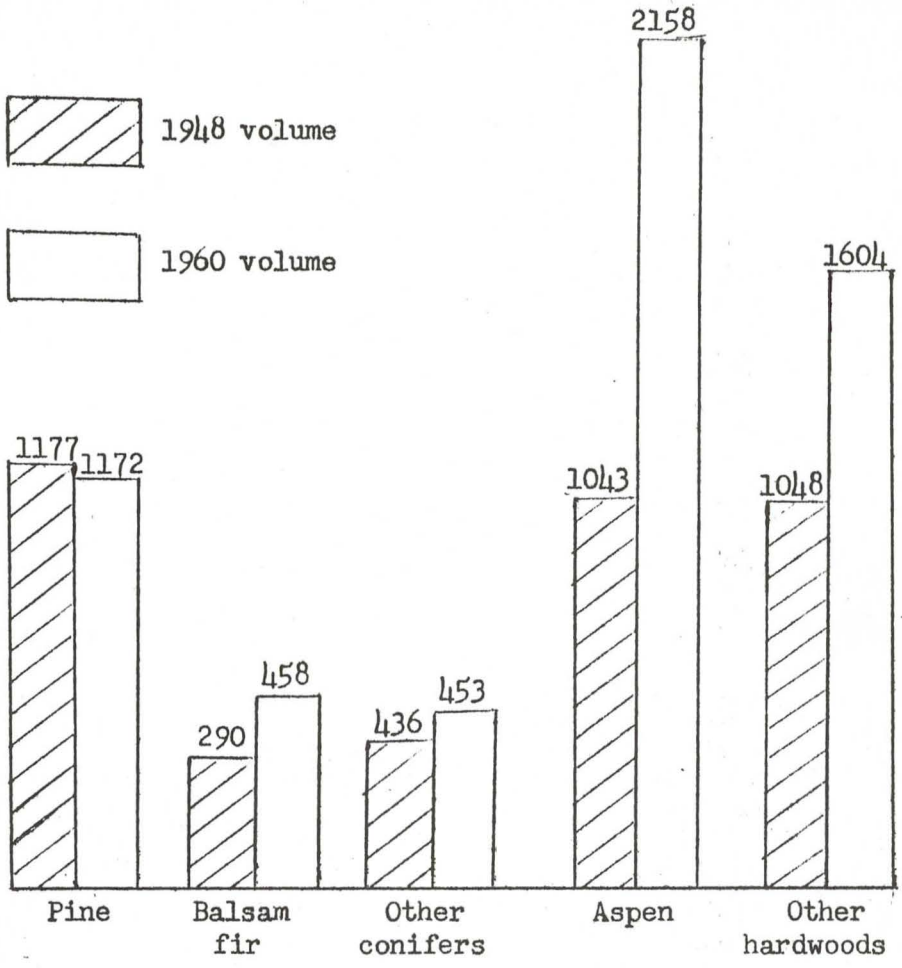


Fig. 3. Growing Stock Volume by Species or Species Groups in 1948 and 1960 (M cords).

Growth

Periodic annual growth is estimated to be 294,407 M cords of growing stock. Almost one-half of the total is aspen (Table 8 Appendix). Conifers make up only about one-third of the growth. Red pine and balsam fir are providing the most growth among the conifers. Average growth per acre is estimated to be .56 cords per acre of timbered commercial forest land. This compares with an estimated growth of .55 cords per acre in 1948.

Growth still falls short of the potential productivity of the land; current growth would be greater if losses caused by supression, insects, and disease could be reduced. Increased markets would improve the growth situation by allowing periodic thinnings or improvement cuts to capture some of the mortality losses now occurring. The loss of potential growth due to understocking is also considerable. Efforts to improve stocking, secure additional markets and insure regeneration of desirable species will continue to have high priority during this plan period.

## PAST TIMBER MANAGEMENT

### Timber Harvest

The annual allowable cut area was established at 11,634 acres in the previous plan. Estimated allowable cut volume was 47,634 MBM. The actual cut did not reach this figure through the plan period (Fig. 4). The lack of aspen pulpwood market was the primary reason the actual cut did not reach the allowable. Less than 1/3 of the actual cut volume was sawtimber. The remainder was pulpwood and a small volume of other convertable products.

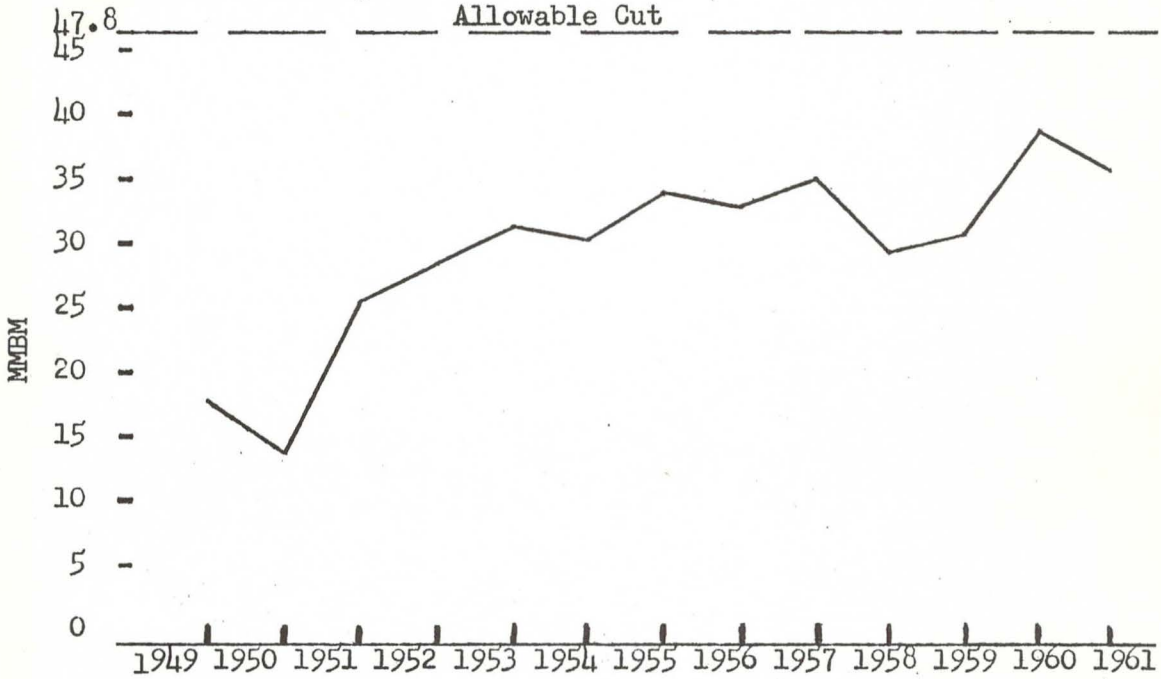


Fig. 4. Actual Cut Compared to Allowable Cut.

### Planting

Total acres of plantation as of July 1, 1961 was 49,790. Of this total, 7,151 acres were established since 1948. Most of the trees planted were red pine. The last few years there has been a gradual increase in the planting of white spruce. No white pine and very little jack pine have been planted during the past management plan period.

Most open field planting has been accomplished and the future plantings will be of a conversion nature or regeneration of harvested pine stands.

## Timber Stand Improvement

Timber stand improvement work gradually increased during the past plan period. Many plantations established during the early part of the plan period have had one or more release treatments. Much of the plantation release was done by aerial application of herbicides.

## Protection

A complete picture of the trend in protection against fire can be obtained from an analysis of the recently completed district fire plans.

The only serious insect outbreak during the past management period was by the jack pine budworm (Choristoneura pinus). Control action was taken in 1959 and 1960. The infestation is still present on the Cass Lake and Bena districts and seems to be spreading eastward. Although mortality has been low, the reduction in growth has been considerable. The larch sawfly (Pristiphora erichsonii) is still prevalent in most tamarack stands. In some areas the mortality has been great. At the present time, there are no economically feasible control measures.

The forest tent caterpillar (Malacosoma disstria) was present in epidemic proportions during the early part of the previous plan period, but no major outbreaks have occurred in the last few years.

Jack pine sawfly (Neodiprion banksianae) and the spruce budworm (Choristoneura fumifirana) have been reported on the forest, but not in epidemic proportions.

The snowshoe hare population is increasing and is expected to peak in the next year or so. Some plantations established during the last 2 or 3 years have suffered heavily from their browsing.

## PLAN OF ACTION

### Management Objectives

(a) Develop markets which will permit the harvest of mature and over-mature aspen and convert to conifer types wherever practicable.
(b) Insure regeneration promptly after all regeneration cuts.
(c) To maintain the present pine type acreage and increase the pine and spruce acreage by conversion of other types.
(d) To reforest non-stocked commercial forest land.
(e) To provide a steady supply of forest products for industry and provide stable employment opportunities through marketing of the full allowable cut.
(f) To maintain or increase stocking of immature stands to levels defined in the R-9 management guides.
(g) Progress toward the development of a permanent utilization road system.
(h) In cooperation with the Lake States Experiment Station, develop techniques such as prescribed burning which will bring about natural regeneration of pine stands and which will permit economic type conversion.
(i) To manage red pine for a final product of large sawtimber size trees.

### Coordination with Other Uses

Timber management will be coordinated to the fullest extent with other uses. The working circle multiple-use plans and R-9 FSH 2110 give direction to means by which this will be done. Timber cutting on areas with a dominant use other than timber production will be modified to the extent needed to enhance the other values.

### Silviculture

The methods of silviculture to be used under this plan are set forth in printed guides for each type. These guides are available in each district's reference library. A brief summary of the usual management methods is given below. Even-age silviculture will be practiced for all types except northern and lowland hardwoods.

| Type | Rotation (Years) | Optimum Residual Stocking for Intermediate Cuts (Sq. ft. basal area) |
|---|---|---|
| White pine | 140 | 100-110 |
| Red pine | 140 | 90-100 |
| Jack pine | 50-70 | 70-80 |
| Spruce-fir | 50-80 | 90 |
| Black spruce | 80-140 | 90 |
| Tamarack | 100 | 80 |
| Aspen | 35-60 | 60 |
| Paper birch | 80 | 60 |
| Other hardwoods | - | 85 |
| Mixed conifer swamp | 80 | 150 |

## Allowable Cut

The cut is controlled by area. Silvicultural need as determined on the inventory points was used to determine the cut. Age class regulation was considered in modifying the cut as set by prescriptions. This method was used because such a large area on the forest contains short-lived transitory species and stand composition will change. It will be many years before age class regulation will control the cut. The method of computing allowable cut area is a tabular one. The cut volume is estimated from examination of cut prescriptions on the inventory sample points (Appendix B). Trees designated as harvest are summarized for the cut volume. Thus the estimate of cut volume comes directly from the plot data.

The allowable cut can generally be divided into two categories; hardwoods and conifers. For conifers, especially pine, the allowable cut will be a limitation and care must be used not to exceed the allowable acres of regeneration cuts. Intermediate cuts are based on individual stand needs so the allowable cut figure is an estimate and may be exceeded as long as residual stocking levels are maintained in accordance with regional guides and cutting is confined to budgeted compartments. Compartments must be budgeted so as to provide a relatively even flow of products through the entire plan period.

For the hardwoods, the allowable cut is a goal. As calculated, it is, in fact, a "desirable cut" and includes all cutting that should be done regardless of present marketability of the species. It is recognized that present market conditions prevent attainment of the allowable cut. However, strenuous efforts are needed to approach the goal. The large acreage of aspen type is composed of well-stocked stands now ready for harvest. As the aspen stands mature, some action is vital. If they cannot be clear cut, drastic measures such as underplanting over-mature stands with conifers must be considered. There is a tremendous job ahead in dealing with the aspen stands.

The annual allowable cut is 10,802 acres in regeneration cuts and 7,864 acres in intermediate cuts (Table 9 Appendix). Regeneration cutting fits the stand for regeneration and includes clearcutting, seeding cuts in red pine, removal of sawtimber overstory in two-storied stands, and partial cuts in sawtimber stands of northern hardwoods and swamp hardwoods. Intermediate cuts include all other partial cuts that are made in the stand between the time of its formation and major harvest.

The allowable cut volume is estimated to be 158,643 cords of growing stock annually (Table 10 Appendix). Included in this volume is 18,958 MBM in sawtimber size trees. Almost 2/3 of the cut is in the aspen type.

Almost 1/2 of the cut is aspen species (Table 11 Appendix). Pine makes up only 14 percent of the cut. Slightly less than 2/3 of the allowable cut is in poletimber size trees (Table 12 Appendix). However, some species are marketed almost entirely as cordwood regardless of size. Very likely over 80 percent of the allowable cut would actually be marketed as cordwood or other convertable products.

The total cut is 54 percent of estimated growth (Table 3). Balsam fir is the only species for which the cut is comparable to the growth. Even though the aspen cut is heavy, it is only 50 percent of growth because most remaining stands are in the period of their rotation where maximum periodic growth is occurring.

Table 3. Estimated Allowable Cut and Growth of Principal Species or Species Groups.

| Species or Groups | Growth | All. Cut | Cut/Growth |
|---|---|---|---|
| | (M Cords) | (M Cords) | (percent) |
| White pine | 7.9 | 5.3 | 67 |
| Red pine | 18.8 | 8.0 | 43 |
| Jack pine | 11.3 | 8.7 | 77 |
| Balsam fir | 18.1 | 15.8 | 87 |
| Other conifers | 19.1 | 9.6 | 50 |
| Aspen | 145.2 | 72.9 | 50 |
| Other hardwoods | 74.0 | 38.3 | 52 |
| ALL SPECIES | 294.4 | 158.6 | 54 |

A summary of harvest operations by types is given in Table 4.

Table 4. Area, Annual Treatment, and Annual Yield by Types.

| Type | Commercial Area | Annual Treatment | | | Annual Yield |
|---|---|---|---|---|---|
| | -Acres- | | | | -Cords- |
| Red & white pine | 52,000 | Regenerate | 800 | acres | 7,000 |
| | | Thin | 1,900 | " | 10,200 |
| Jack pine | 29,000 | Regenerate | 400 | " | 6,700 |
| | | Thin | 1,100 | " | 3,200 |
| Spruce-fir | 13,000 | Regenerate | 200 | " | 3,000 |
| | | Thin | 400 | " | 3,000 |
| Spruce | 22,000) | | | | |
| Tamarack | 16,000) | Regenerate | 500 | " | 5,400 |
| Cedar | 21,000) | Thin | 500 | " | 1,400 |
| Northern Hdwd. & Oak | 63,000 | Selection | 2,300 | " | 8,500 |
| Lowland Hardwood | 18,000 | Selection | 900 | " | 4,200 |
| Aspen-birch | 291,000 | Regenerate | 6,800 | " | 94,400 |
| | | Thin | 2,900 | " | 11,600 |
| Non-stocked | 45,000 | - | - | | - |
| | 570,000 | | | | 158,600 |

Future Yields

The allowable cut in the year 2,000 will depend in a large measure on the success of the aspen conversion program in the interim period. If a large area of aspen is converted to pine, growth will be excellent in the year 2,000; but the cut will still be much less than the growth because a large proportion of the conifer stands will be young plantations.

The swamp conifer types are not expected to yield more than .3 cords per acre annually. The upland type yield will average .6 cords per acre per year. Total yield in the year 2,000 is expected to be 320,000 cords.

Ultimate sustained yield is expected to average .9 cords per acre per year for the upland types and .4 cords for the lowland types or a total yield of about 480,000 cords per year.

Artificial Regeneration

Two of the major management objectives are to maintain the pine type and convert aspen stands to pine or spruce. Both objectives will require planting or other measures for fulfillment. A considerable area of pine will be given a regeneration cut during the plan period. In some cases, natural regeneration will be obtained, but it is estimated that 6,000 acres will need planting or seeding. This has the highest priority in the planting program.

The second highest priority will be given to planting non-stocked or poorly stocked areas now in need of planting.

Another goal will be to convert aspen or other hardwood stands of site index 60 or higher to pine on pine sites and spruce on spruce-fir sites wherever practicable. Stands with site index 50 or lower for aspen will be converted only if the site is judged to be medium for pine or spruce.

In aspen conversion, qualifying sites will be regenerated to pine after a harvest cut wherever practicable. If aspen harvest and conversion does not meet the plan objectives, consideration will be given to underplanting aspen or other hardwood stands that are poorly stocked or that have reached their pathological rotation even though a harvest cut is not made.

Lowest priority for planting during this plan period will be given to reforesting the lowland brush areas on which planting is difficult and costly. Research is needed to find better ways to reforest such areas before a full program of planting is undertaken.

Seeding will not be used as an artificial regeneration measure unless research develops methods that will insure as good results as planting and for the same costs.

The total regeneration program for this plan period is as follows:

6,000 acres pine regeneration.
34,000 acres non-stocked and poorly-stocked stands now in need of regeneration (including less than 2,000 acres lowland brush).
29,000 acres of aspen and other hardwood conversion.

This desirable and needed program calls for at least 69,000 acres to be artificially regenerated. It must be emphasized that this program is only a small part of the total regeneration and conversion job needed. At the above rate, at least 40 years will be required to convert the Chippewa to desired forest types.

Timber Stand Improvement

Highest priority will be given to the release of established plantations in the stand improvement program. Other stand improvement will consist primarily of cull tree removal as post-sale treatment. The northern hardwood type, especially, needs treatment to improve stand quality. Aspen stands will be treated only as needed to reduce the residual hardwood basal area to required levels for aspen regeneration or to remove residual trees preparatory to planting.

Non-commercial thinning and pruning will have low priority in determining stand improvement needs. Pruning will be confined to the best red pine sites and stands.

There is a total of 88,000 acres on which some form of timber stand improvement work could be carried out (Table 13 Appendix). If the planting program outlined above was accomplished, there would be an aggregate of about 80,000 acres of plantation release during the plan period. This estimate is based on the fact that most plantations will require more than one release job in ten years to become successfully established.

Policy statements in regard to planting, T.S.I., sales, slash disposal and K-V are covered adequately in FSH 2400.

Transportation

Plans for land utilization roads have been completed for each district. During this plan period, efforts will be continued toward developing a good road network on each working circle. Roads will be built to the extent and standards that the timber sales can support. In addition, a vigorous road construction program will be undertaken with supplemental funds.

Management Plan Controls

The compartment folder will be the basic unit for all record keeping. Sale progress and cut and sold acreage records will be maintained in the folder for each compartment. Planting and T.S.I. projects will also be recorded here on compartment photo maps.

A. Timber sales records.

1. The compartment index map (1" per mile) shows the numbering and boundaries of the compartments. It will be used to show the fiscal year in which the compartments are scheduled to come up for sale and will be posted each year as the three-year cutting budget is extended. The compartments are scheduled by outlining the boundary in the color of the appropriate fiscal year. (See color code below).

Last digit of F.Y.

| | | |
|---|---|---|
| F.Y. 1962 | Orange | Dixon 324 |
| 3 | Violet | Dixon 323 |
| 4 | Light Green | Faber 14 |
| 5 | Gray | Dixon 352½ |
| 6 | Yellow | Dixon 353 |
| 7 | Black | Dixon 351 |
| 8 | Dark Green | Dixon 354 |
| 9 | Brown | Dixon 343 |
| F.Y. 1970 | Red | Dixon 321½ |
| 1 | Blue | Dixon 350 |

The compartment index map should be readily available, preferably posted on a wall and covered with a sheet of clear plastic matex. Open sales will then be outlined on the matex with black grease pencil. When sales close, they can easily be erased with tissue paper.

2. The "Three-Year Cutting Budget and Development Schedule", Chippewa Form 2410-2, will be attached to each working circle's timber management plan. This will be kept on file in front of the compartment folders 1/. The cutting budget will be maintained three years in advance of sales preparation. Annually, on March 1, a preliminary listing of compartments will be set up and added to the cutting budget and at the same time, scheduled for compartment examination.

1/ The "estimated operable acres" on this form is obtained from the IBM listing "Area Summary of Adequately Stocked Small Poletimber and Larger by Compartments, Forest Types and Condition Class".

At the end of the fiscal year when the examination work is completed, volume data, road survey needs, costs, and right-of-way needs are all posted. Sufficient data will be collected to prepare an annual sales plan. By July 1, annually, the road and right-of-way needs are summarized on R-9 2410-5 and submitted to the Supervisor's Office. This information will aid in planning road surveys and facilitate the acquisition of rights-of-way.

Example of compartment budgeting procedures:

On March 1, 1962, compartments which will actually come up for sale in fiscal year 1966 are added to the three-year cutting budget. These compartments are scheduled for field examination during F.Y. 1963. At the end of F.Y. 1963, the road and rights-of-way data gathered during the course of examination is entered under the development schedule section. Then in turn, this information is summarized on the R-9 form 2410-5 and sent to the Supervisor's Office by July 1, 1963.

The budgeting of compartments should be done carefully so as to provide a steady flow of timber products. When possible, those compartments that have gone the longest without cutting should be scheduled earliest in the plan period.

3. Annual Sales Plan - Chippewa Form 2410-8 (equivalent to R-9 2410-1). This is the action plan for each year. The compartments are set up for sale by referring to the three-year cutting budget. The reverse side of the form will be used to provide an estimate of the distribution of the timber sale preparation job by sale size class and type of sale.

   The information on this form will also be compiled by March 1, annually; it will then be available for the timber business report. Careful development of the annual sales plan will facilitate preparation of the annual timber sale program which is a detailed listing of proposed sales that is released to the public (R-9 FSH 2431.1).

4. The Compartment Acreage Control Record, Chippewa Form 2410-9 (equivalent to R-9 2410-4), will be used for posting cut and sold acres. Sold acres must be recorded promptly as sales are made. Cut acres will be recorded as sales are closed, extended or reappraised or as cutting blocks are completed and accepted. Care must be used to insure that the total acres cut are reconciled with total acres sold when the sale is closed. As the cut data is entered on the above mentioned form, it will also be posted to Chippewa Form 2410-10, Annual Summary of Cut Acres. This will be totaled and forwarded to the Supervisor's Office by July 10 of each year.

The maintenance of these two records is very important, for from them is derived the control of the allowable cut. Annually, the Supervisor's Office will furnish each district with a copy of the Annual Timber Sale Accomplishment Record. This will inform the districts how they stand in their sold accomplishments and allowable cut objectives. Unsold blow down, insect kill, or TSI in merchantable timber will be credited to appropriate allowable cut acres and properly designated under the "sale information" heading.

5. Timber Sales Progress Map - This will be a compartment photo map set up in each compartment to record timber sales progress as sales are made. The area will be outlined on the compartment photo map in the designated color of the year in which made. As cutting on a sale or block is completed and the cut acres recorded as described under item 4 above, the area will be lined diagonally with the color of the year in which the cut was reported. All cutting since the date of typing will be delineated even though done before the beginning of this plan period.

B. Planting records.

In each compartment a photo map will be set up to show the plantations established since the date of type mapping. New plantings will be outlined in black ink on the photo map. Plantation number, species, age of stock, and year planted will be shown. This information will agree with that shown on the Planting and Seeding Report, FS 2460-4 (old 134 R-9). By using the compartment photo maps, the need for completing field map sheets will be eliminated. The compartment photo map will be submitted to the Supervisor's Office along with the Planting and Seeding Report. It will then be photo copied and returned to the district to be filed in the appropriate compartment folder. The Planting and Seeding Report will indicate the Compartment number in which each plantation was established. The maintenance of other planting records is covered in FSH 2460.

C. Timber stand improvement records.

In each compartment, a photo map will be set up to show the timber stand improvement work accomplished since the date of type mapping. Release work will be indicated by cross hatching the area in the color of the year in which the work was accomplished.

Maintenance of other records and further instructions on timber stand improvement work is covered in FSH 2470.

Statistical Summary

A total of 6,094 10 factor point samples were taken on timbered commercial forest land (Table 14 Appendix). Sampling error of total volume on the forest is 2.9% at 95% probability.

Table 1. Total Area Summary
Chippewa National Forest
(Acres)

| Forest Type | Total | Reproduction | | Small Poles | | Large Poles | | Sawtimber | |
|---|---|---|---|---|---|---|---|---|---|
| | | Poor | Adequate | Poor | Adequate | Poor | Adequate | Poor | Adequate |
| SOFTWOODS: | | | | | | | | | |
| White Pine | 7,950 | 10 | 159 | 26 | 131 | 120 | 325 | 5,163 | 2,016 |
| Red Pine | 44,464 | 392 | 7,072 | 237 | 2,592 | 1,189 | 4,604 | 16,827 | 11,551 |
| Jack Pine | 28,586 | 325 | 2,426 | 1,184 | 7,467 | 2,537 | 9,882 | 1,638 | 3,127 |
| Spruce-fir | 12,964 | 357 | 1,364 | 1,028 | 4,117 | 769 | 4,486 | 313 | 530 |
| Black Spruce | 22,297 | 1,926 | 4,781 | 2,718 | 12,055 | 122 | 695 | | |
| Tamarack | 16,184 | 749 | 2,281 | 1,972 | 9,175 | 456 | 1,496 | 21 | 34 |
| Swamp Conifers | 21,212 | 355 | 2,342 | 1,818 | 10,359 | 332 | 5,491 | 26 | 489 |
| Total | 153,657 | 4,114 | 20,425 | 8,983 | 45,896 | 5,525 | 26,979 | 23,988 | 17,747 |
| HARDWOODS: | | | | | | | | | |
| Northern Hdwds. | 56,181 | 195 | 1,263 | 1,909 | 8,808 | 4,155 | 15,549 | 6,644 | 17,658 |
| Oak | 6,780 | 3 | 613 | 489 | 2,732 | 825 | 1,569 | 299 | 250 |
| Lowland Hdwds. | 17,689 | 47 | 404 | 600 | 1,389 | 2,128 | 5,217 | 2,916 | 4,988 |
| Aspen | 274,810 | 618 | 20,675 | 18,971 | 91,948 | 29,718 | 95,684 | 10,665 | 6,531 |
| Paper Birch | 15,943 | 129 | 1,135 | 1,934 | 6,657 | 2,272 | 3,512 | 167 | 137 |
| Total | 371,403 | 992 | 24,090 | 23,903 | 111,534 | 39,098 | 121,531 | 20,691 | 29,564 |
| All Types | 525,060 | 5,106 | 44,515 | 32,886 | 157,430 | 44,623 | 148,510 | 44,679 | 47,311 |

| Nonstocked Forest Land | Area |
|---|---|
| Upland Brush | 3,380 |
| Lowland Brush | 37,946 |
| Open | 3,996 |
| Total | 45,322 |

| Nonforest Land | Area |
|---|---|
| Marsh & Muskeg | 34,939 |
| Water | 4,351 |
| Other1/ | 17,290 |
| Total | 56,580 |

| Noncommercial Forest Land | Area |
|---|---|
| Unproductive Lowland | 2,226 |
| Reserved | 76 |
| Other | 10,188 |
| Total | 12,490 |

Total Land Area 639,452 Acres

1/ Over

Table 2. Area of timbered commercial forest land by primary and secondary forest type.

Chippewa National Forest

(Acres)

| Primary Forest Type | Total | Oak | Secondary Forest Type: White Pine | Red Pine | Jack Pine | Spruce-fir | Black Spruce | Tamarack | Swamp Conifers | N.Hdwd. | L. Hdwd. | Aspen | Paper Birch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| White Pine | 5,498 | | | 107 | 9 | 752 | 6 | | | 1,283 | 11 | 2,879 | 451 |
| Red Pine | 21,036 | 20 | 387 | 4,317 | 1,976 | 975 | 4 | | 206 | 724 | 70 | 9,419 | 2,938 |
| Jack Pine | 6,403 | 135 | | 1,572 | 750 | 232 | 21 | | | | | 3,052 | 641 |
| Spruce-fir | 3,983 | | | 13 | 21 | 461 | | | 65 | 104 | 316 | 2,254 | 749 |
| Black Spruce | 556 | | | | | | 174 | 371 | 11 | | | | |
| Tamarack | 1,132 | | | | | 14 | 755 | 38 | 227 | | 28 | | 70 |
| Swamp Conifers | 731 | | | | | 87 | | | 237 | | 134 | 151 | 122 |
| Northern Hdwd. | 17,567 | | | 26 | 25 | 7,289 | 170 | | 97 | 2,607 | | 4,799 | 2,554 |
| Oak | 2,737 | 45 | | | 136 | | | | | 390 | | 1,130 | 1,036 |
| Lowland Hdwd. | 8,123 | | | | | 3,735 | | | 1,244 | | 203 | 2,917 | 24 |
| Aspen | 89,276 | 290 | 1,414 | 2,879 | 1,997 | 51,607 | 384 | 341 | 2,003 | 5,339 | 1,182 | 10,651 | 11,189 |
| Paper Birch | 7,458 | | 47 | 151 | 99 | 3,901 | 65 | | 212 | 813 | 53 | 2,117 | |
| Total | 164,500 1/ | 490 | 1,848 | 9,065 | 5,013 | 69,053 | 1,579 | 750 | 4,302 | 11,260 | 1,997 | 39,369 | 19,774 |

1/ 360,560 acres had no secondary type.

Table 3. Area of Timbered Commercial Forest Land
By Forest Type and Age Classes
Chippewa National Forest
(Acres)

| Forest Type | Total | AGE CLASS (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0-15 | 16-25 | 26-35 | 36-45 | 46-55 | 56-65 | 66-75 | 76-85 | 86+ | ALL AGE |
| White Pine | 7,960 | | 240 | 60 | 20 | 840 | 330 | 610 | 2,560 | 3,300 | |
| Red Pine | 44,470 | 4,730 | 3,540 | 1,260 | 4,080 | 4,160 | 6,920 | 4,990 | 8,610 | 6,180 | |
| Jack Pine | 28,580 | | 2,960 | 4,760 | 10,680 | 8,200 | 1,440 | 80 | 290 | 170 | |
| Spruce-fir | 12,950 | 190 | 850 | 740 | 3,620 | 3,820 | 1,850 | 1,620 | 110 | 120 | 30 |
| Black Spruce | 22,300 | 210 | 570 | 920 | 3,330 | 2,190 | 2,810 | 4,440 | 4,530 | 3,300 | |
| Tamarack | 16,190 | 40 | 10 | 1,230 | 2,810 | 3,250 | 2,990 | 2,690 | 1,530 | 1,420 | 220 |
| Swamp Conifers | 21,190 | 280 | | 10 | 90 | 990 | 810 | 200 | 840 | 460 | 17,510 |
| Northern Hdwds. | 56,200 | | | 180 | | | | 160 | | | 55,860 |
| Oak | 6,780 | | | 310 | 1,470 | 350 | 460 | 150 | 230 | | 3,810 |
| Lowland Hdwds. | 17,690 | | | | | | | | | | 17,690 |
| Aspen | 274,820 | 4,170 | 23,500 | 98,140 | 92,420 | 42,220 | 12,160 | 1,950 | 260 | | |
| Paper Birch | 15,930 | | 950 | 4,520 | 4,920 | 3,210 | 1,790 | 520 | 20 | | |
| All Types | 525,060 | 9,620 | 32,620 | 112,130 | 123,440 | 69,230 | 31,560 | 17,410 | 18,980 | 14,950 | 95,120 |

Table 4. Area of Timbered Commercial Forest Land
By Forest Type and Site Index Classes
Chippewa National Forest
(Acres)

| Forest Type | Total | SITE INDEX CLASS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| White Pine | 7,960 | | | | 1,760 | 5,000 | 900 | 300 | |
| Red Pine | 44,470 | | | 110 | 14,060 | 21,440 | 8,600 | 260 | |
| Jack Pine | 28,580 | | | 360 | 440 | 8,670 | 17,820 | 1,290 | |
| Spruce-fir | 12,950 | | 160 | 780 | 2,910 | 6,490 | 2,080 | 530 | |
| Black Spruce | 22,300 | 520 | 5,880 | 9,270 | 5,380 | 860 | 390 | | |
| Tamarack | 16,190 | 90 | 1,470 | 4,250 | 7,160 | 2,960 | 260 | | |
| Swamp Conifers | 21,190 | | 6,240 | 9,970 | 4,490 | 230 | 260 | | |
| Northern Hdwds. | 56,200 | | | 220 | 2,420 | 34,400 | 18,230 | 930 | |
| Oak | 6,780 | | | 530 | 2,190 | 3,580 | 470 | 10 | |
| Lowland Hdwds. | 17,690 | | 20 | 380 | 1,550 | 9,750 | 5,780 | 210 | |
| Aspen | 274,820 | | | 110 | 450 | 7,250 | 159,090 | 92,450 | 15,470 |
| Paper Birch | 15,930 | | | | 370 | 7,310 | 6,470 | 1,780 | |
| All Types | 525,060 | 610 | 13,770 | 25,980 | 43,180 | 107,940 | 220,350 | 97,760 | 15,470 |

Table 5. Net Volume of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Species & Growing Stock Classes

Chippewa National Forest

| Species | All | | Good Growing Stock | | Poor Growing Stock | | Harvest | |
|---|---|---|---|---|---|---|---|---|
| | Cords[1] | MBM[2] | Cords[1] | MBM[2] | Cords[1] | MBM[2] | Cords[1] | MBM[2] |
| SOFTWOODS: | | | | | | | | |
| White Pine | 236,124 | 76,936 | 97,867 | 31,233 | 21,507 | 4,629 | 116,750 | 41,074 |
| Red Pine | 596,847 | 180,700 | 457,934 | 130,866 | 35,381 | 7,845 | 103,532 | 41,989 |
| Jack Pine | 339,192 | 45,851 | 157,437 | 14,140 | 69,006 | 5,080 | 112,749 | 26,631 |
| Balsam Fir | 458,484 | 39,844 | 231,543 | 7,730 | 35,935 | 591 | 191,006 | 31,523 |
| White Spruce | 61,291 | 13,942 | 23,066 | 4,200 | 6,337 | 566 | 31,888 | 9,176 |
| Black Spruce | 152,268 | 2,129 | 105,797 | 623 | 14,717 | 88 | 31,754 | 1,418 |
| Tamarack | 119,698 | 3,713 | 49,399 | 223 | 18,631 | 211 | 51,668 | 3,279 |
| White-cedar | 119,495 | 9,542 | 31,443 | 1,266 | 27,153 | 593 | 60,899 | 7,683 |
| Total | 2,083,399 | 372,657 | 1,154,486 | 190,281 | 228,667 | 19,603 | 700,246 | 162,773 |
| HARDWOODS: | | | | | | | | |
| Sugar Maple | 91,003 | 12,825 | 20,471 | 1,966 | 29,324 | 2,313 | 41,208 | 8,546 |
| Yellow Birch | 10,863 | 3,514 | 1,732 | 144 | 2,806 | 211 | 6,325 | 3,159 |
| Oak | 181,673 | 15,841 | 56,188 | 2,788 | 61,376 | 895 | 64,109 | 12,158 |
| Basswood | 225,967 | 27,631 | 102,877 | 7,501 | 55,482 | 3,270 | 67,608 | 16,860 |
| Elm | 130,693 | 22,390 | 24,977 | 3,362 | 36,633 | 2,607 | 69,083 | 16,421 |
| Aspen | 2,158,155 | 95,305 | 966,042 | 5,301 | 207,051 | 197 | 985,062 | 89,807 |
| Balsam Poplar | 156,713 | 18,676 | 54,004 | 922 | 17,349 | 18 | 85,360 | 17,736 |
| Paper Birch | 592,144 | 25,194 | 216,745 | 6,556 | 206,843 | 2,076 | 168,556 | 16,562 |
| Red Maple | 30,355 | 1,441 | 5,557 | 62 | 9,461 | 99 | 15,337 | 1,280 |
| Ash | 181,840 | 13,529 | 79,567 | 4,659 | 50,793 | 1,600 | 51,480 | 7,270 |
| Other Hardwoods | 2,087 | | | | 1,879 | | 208 | |
| Total | 3,761,493 | 236,346 | 1,528,160 | 33,261 | 678,997 | 13,286 | 1,554,336 | 189,799 |
| All Species | 5,844,892 | 609,003 | 2,682,646 | 223,542 | 907,664 | 32,889 | 2,254,582 | 352,572 |

1/ All live merchantable trees 5.0" d.b.h. and larger to a variable top of not less than 4.0" d.i.b.

2/ All live merchantable trees 9.0" (softwoods), 11.0" (hardwoods) d.b.h. and larger to a variable top of not less than 8.0" d.i.b. Scribner Rule.

Table 6. Net Volume of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Species and Size Classes

Chippewa National Forest

| Species | Growing Stock | | | | Sawtimber | |
|---|---|---|---|---|---|---|
| | Total | Poles[1] | Small Saw.[2] | Large Saw.[3] | Small[2] | Large[3] |
| | -Cords- | -Cords- | -Cords- | -Cords- | MBM | MBM |
| SOFTWOODS: | | | | | | |
| White Pine | 236,124 | 31,952 | 81,699 | 122,473 | 22,210 | 54,726 |
| Red Pine | 596,847 | 99,703 | 260,882 | 236,262 | 79,259 | 101,441 |
| Jack Pine | 339,192 | 158,530 | 167,398 | 13,264 | 41,090 | 4,761 |
| Balsam Fir | 458,484 | 294,495 | 158,897 | 5,092 | 38,241 | 1,603 |
| White Spruce | 61,291 | 16,507 | 33,783 | 11,001 | 9,503 | 4,439 |
| Black Spruce | 152,268 | 142,901 | 8,716 | 651 | 1,855 | 274 |
| Tamarack | 119,698 | 103,597 | 16,101 | | 3,713 | |
| White-cedar | 119,495 | 75,705 | 40,090 | 3,700 | 8,398 | 1,144 |
| Total | 2,083,399 | 923,390 | 767,566 | 392,443 | 204,269 | 168,388 |
| HARDWOODS: | | | | | | |
| Sugar Maple | 91,003 | 54,790 | 24,767 | 11,446 | 9,977 | 4,419 |
| Yellow Birch | 10,863 | 5,077 | 2,888 | 2,898 | 930 | 1,013 |
| Oak | 181,673 | 131,984 | 30,209 | 19,480 | 8,990 | 6,851 |
| Basswood | 225,967 | 143,545 | 59,116 | 23,306 | 18,503 | 9,128 |
| Elm | 130,693 | 66,636 | 41,645 | 22,412 | 13,585 | 8,805 |
| Aspen | 2,158,155 | 1,836,234 | 283,650 | 38,271 | 80,798 | 14,507 |
| Balsam Poplar | 156,713 | 113,903 | 30,597 | 12,213 | 12,958 | 5,718 |
| Paper Birch | 592,144 | 502,679 | 76,983 | 12,482 | 21,022 | 4,172 |
| Red Maple | 30,355 | 24,725 | 4,711 | 919 | 1,198 | 243 |
| Ash | 181,840 | 138,284 | 35,624 | 7,932 | 10,628 | 2,901 |
| Other Hdwds. | 2,087 | 2,087 | | | | |
| Total | 3,761,493 | 3,019,944 | 590,190 | 151,359 | 178,589 | 57,757 |
| All Species | 5,844,892 | 3,943,334 | 1,357,756 | 543,802 | 382,858 | 226,145 |

1/ Softwoods 5.0"-8.9", hardwoods 5.0"-10.9" d.b.h.
2/ Softwoods 9.0"-14.9", hardwoods 9.0"-14.9" d.b.h.
3/ All species 15.0"+ d.b.h.

Table 7. Number of Growing Stock and Cull Trees on Timbered Commercial Forest Land by Species and Size Class

Chippewa National Forest

(Thousand Trees)

| Species | Growing Stock | | | | | Culls | |
|---|---|---|---|---|---|---|---|
| | Total | Sapling | Poles | Small Saw. | Large Saw. | Sapling & Poles | Saw-timber |
| SOFTWOODS: | | | | | | | |
| White Pine | 2,482 | 1,401 | 508 | 392 | 181 | 359 | 4 |
| Red Pine | 8,224 | 4,548 | 2,128 | 1,183 | 365 | 536 | 10 |
| Jack Pine | 10,090 | 5,592 | 3,524 | 944 | 30 | 574 | 30 |
| Balsam Fir | 26,531 | 18,495 | 6,947 | 1,079 | 10 | 1,728 | 55 |
| White Spruce | 3,103 | 2,490 | 427 | 165 | 21 | 133 | 8 |
| Black Spruce | 15,222 | 11,534 | 3,627 | 60 | 1 | 605 | 8 |
| Tamarack | 8,689 | 5,999 | 2,573 | 117 | | 1,605 | 12 |
| White-cedar | 6,905 | 4,152 | 2,458 | 287 | 8 | 1,223 | 298 |
| Total | 81,246 | 54,211 | 22,192 | 4,227 | 616 | 6,763 | 425 |
| HARDWOODS: | | | | | | | |
| Sugar Maple | 13,148 | 11,711 | 1,265 | 139 | 33 | 4,940 | 199 |
| Yellow Birch | 482 | 368 | 91 | 16 | 7 | 67 | 11 |
| Oak | 9,112 | 5,682 | 3,229 | 153 | 48 | 2,389 | 66 |
| Basswood | 10,719 | 7,299 | 3,099 | 267 | 54 | 2,790 | 52 |
| Elm | 6,058 | 4,375 | 1,409 | 221 | 53 | 1,679 | 94 |
| Aspen | 78,249 | 46,999 | 29,907 | 1,235 | 108 | 8,996 | 537 |
| Balsam Poplar | 6,523 | 4,197 | 2,160 | 138 | 28 | 1,195 | 40 |
| Paper Birch | 37,296 | 26,496 | 10,433 | 337 | 30 | 3,850 | 52 |
| Red Maple | 8,551 | 7,843 | 681 | 25 | 2 | 2,748 | 35 |
| Ash | 16,847 | 13,772 | 2,902 | 156 | 17 | 2,338 | 30 |
| Other Hdwds. | 2,123 | 2,035 | 88 | | | 1,784 | |
| Total | 189,108 | 130,777 | 55,264 | 2,687 | 380 | 32,776 | 1,116 |
| All Species | 270,354 | 184,988 | 77,456 | 6,914 | 996 | 39,539 | 1,541 |

* Less than ½ of 1 significant unit.

Table 8. Net Annual Growth of Growing Stock and Sawtimber on Timbered Commercial Forest Land by Species
Chippewa National Forest

| Species | Growing Stock[1] (Cords) | Sawtimber[2] (M Bd. Ft. Scribner) |
|---|---|---|
| SOFTWOODS: | | |
| White Pine | 7,881 | 4,177 |
| Red Pine | 18,756 | 8,309 |
| Jack Pine | 11,315 | 2,432 |
| Balsam Fir | 18,086 | 3,769 |
| White Spruce | 2,913 | 1,414 |
| Black Spruce | 6,165 | 223 |
| Tamarack | 5,667 | 357 |
| Cedar | 4,374 | 644 |
| Total | 75,157 | 21,325 |
| HARDWOODS: | | |
| Sugar Maple | 2,625 | 755 |
| Yellow Birch | 172 | 45 |
| Oak | 10,342 | 1,068 |
| Basswood | 7,756 | 1,750 |
| Elm | 4,389 | 1,463 |
| Aspen | 145,179 | 12,591 |
| Balsam Poplar | 10,957 | 2,112 |
| Paper Birch | 29,481 | 1,753 |
| Red Maple | 1,113 | 104 |
| Ash | 7,189 | 832 |
| Other Hardwoods | 47 | - |
| Total | 219,250 | 22,473 |
| All Species | 294,407 | 43,798 |

1/ All live merchantable trees 5.0" d.b.h. and larger plus ingrowth trees, to a variable top of not less than 4.0" d.i.b.

2/ All live merchantable trees 9.0" (softwoods), 11.0" (hardwoods) d.b.h. and larger plus ingrowth trees, to a variable top of not less than 8.0" d.i.b. Scribner Rule.

Table 9. Annual Allowable Cut Area of Timbered Commercial Forest Land by Forest Type, Size Class and Type of Cutting

Chippewa National Forest

(Acres)

| Forest Type | All | | Small Poles | | Large Poles | | Sawtimber | |
|---|---|---|---|---|---|---|---|---|
| | Harvest | Inter-mediate | Harvest | Inter-mediate | Harvest | Inter-mediate | Harvest | Inter-mediate |
| White Pine | 425 | 146 | | | | | 425 | 146 |
| Red Pine | 357 | 1,765 | | 84 | | 324 | 357 | 1,357 |
| Jack Pine | 379 | 1,116 | | 335 | 58 | 652 | 321 | 129 |
| Spruce-fir | 195 | 355 | 56 | 93 | 126 | 215 | 13 | 47 |
| Black Spruce | 137 | 39 | 110 | | 27 | 39 | | |
| Tamarack | 185 | | 59 | | 124 | | 2 | |
| Swamp Conifers | 179 | 481 | 65 | 185 | 96 | 275 | 18 | 21 |
| Northern Hdwds. | 1,602 | 641 | | 153 | | 488 | 1,602 | |
| Oak | 56 | 64 | | | 2 | 64 | 54 | |
| Lowland Hdwds. | 527 | 335 | | | | 335 | 527 | |
| Aspen | 6,664 | 2,717 | 488 | 536 | 4,703 | 2,181 | 1,473 | |
| Paper Birch | 96 | 205 | 6 | 11 | 67 | 193 | 23 | 1 |
| All | 10,802 | 7,864 | 784 | 1,397 | 5,203 | 4,766 | 4,815 | 1,701 |

Table 10. Net Annual Allowable Cut of Sawtimber and Growing Stock on Timbered Commercial Forest Land by Forest Type, Size and Type of Cutting

Chippewa National Forest

| Forest Type | Total | | Poles | | | | Sawtimber | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Regeneration | | Intermediate | | Regeneration | | Intermediate | |
| | Cords 1/ | MBM 2/ | Cords 1/ | MBM 2/ | Cords 1/ | MBM 2/ | Cords 1/ | MBM 2/ | Cords 1/ | MBM 2/ |
| White Pine | 4,115 | 957 | | | | | 3,322 | 815 | 793 | 142 |
| Red Pine | 13,072 | 2,808 | | | 1,474 | 210 | 4,095 | 1,095 | 7,503 | 1,503 |
| Jack Pine | 9,895 | 1,640 | 834 | 119 | 2,619 | 372 | 5,886 | 1,040 | 556 | 109 |
| Spruce-fir | 6,000 | 921 | 2,657 | 400 | 2,512 | 359 | 300 | 37 | 531 | 125 |
| Black Spruce | 1,376 | 16 | 1,334 | 11 | 42 | 5 | | | | |
| Tamarack | 1,398 | 54 | 1,375 | 52 | | | 23 | 2 | | |
| Swamp Conifers | 4,066 | 430 | 2,260 | 124 | 1,328 | 206 | 432 | 92 | 46 | 8 |
| Northern Hdwds. | 7,935 | 1,644 | | | 1,724 | 236 | 6,211 | 1,408 | | |
| Oak | 557 | 114 | 31 | 1 | 211 | 46 | 309 | 65 | 6 | 2 |
| Lowland Hdwds. | 4,236 | 940 | | | 1,756 | 292 | 2,480 | 648 | | |
| Aspen | 104,081 | 9,185 | 70,761 | 4,525 | 11,447 | 1,398 | 21,739 | 3,249 | 134 | 13 |
| Paper Birch | 1,912 | 249 | 584 | 45 | 949 | 146 | 367 | 54 | 12 | 4 |
| All Types | 158,643 | 18,958 | 79,836 | 5,277 | 24,062 | 3,270 | 45,164 | 8,505 | 9,581 | 1,906 |

1/ All live merchantable trees 5.0" d.b.h. and larger to a variable top of not less than 4.0" d.i.b.

2/ All live merchantable trees 9.0" (softwoods), 11.0" (hardwoods) d.b.h. and larger to a variable top of not less than 8.0" d.i.b. Scribner Rule.

Table 11. Net Annual Allowable Cut of Sawtimber and Growing Stock on Timbered Commercial Forest Land by Species and Types of Cuttings

Chippewa National Forest

| Species | All | | Regeneration | | Intermediate | |
|---|---|---|---|---|---|---|
| | Cords1/ | MBM2/ | Cords1/ | MBM2/ | Cords1/ | MBM2/ |
| SOFTWOODS: | | | | | | |
| White Pine | 5,344 | 1,843 | 3,233 | 1,191 | 2,111 | 652 |
| Red Pine | 8,014 | 2,592 | 4,024 | 1,539 | 3,990 | 1,053 |
| Jack Pine | 8,680 | 1,743 | 5,425 | 1,060 | 3,255 | 683 |
| Balsam Fir | 15,774 | 1,976 | 11,605 | 1,331 | 4,169 | 645 |
| White Spruce | 2,079 | 517 | 1,521 | 381 | 558 | 136 |
| Black Spruce | 2,263 | 50 | 2,066 | 37 | 197 | 13 |
| Tamarack | 2,290 | 142 | 2,232 | 138 | 58 | 4 |
| Cedar | 2,974 | 332 | 2,108 | 217 | 866 | 115 |
| Total | 47,418 | 9,195 | 32,214 | 5,894 | 15,204 | 3,301 |
| HARDWOODS: | | | | | | |
| Sugar Maple | 1,071 | 197 | 923 | 186 | 148 | 11 |
| Yellow Birch | 327 | 85 | 319 | 85 | 8 | |
| Oak | 3,895 | 520 | 2,704 | 379 | 1,191 | 141 |
| Basswood | 2,633 | 408 | 2,345 | 381 | 288 | 27 |
| Elm | 2,867 | 534 | 2,298 | 399 | 569 | 135 |
| Aspen | 72,912 | 5,788 | 62,653 | 4,784 | 10,259 | 1,004 |
| Balsam Poplar | 5,321 | 919 | 4,766 | 745 | 555 | 174 |
| Paper Birch | 17,127 | 868 | 12,692 | 580 | 4,435 | 288 |
| Red Maple | 888 | 26 | 646 | 20 | 242 | 6 |
| Black Ash | 4,184 | 419 | 3,458 | 333 | 726 | 86 |
| Total | 111,225 | 9,764 | 92,804 | 7,892 | 18,421 | 1,872 |
| All Species | 158,643 | 18,959 | 125,018 | 13,786 | 33,625 | 5,173 |

1/ All live merchantable trees 5.0" d.b.h. and larger to a variable top of not less than 4.0" d.i.b.

2/ All live merchantable trees 9.0" (softwoods), 11.0" (hardwoods) d.b.h. and larger to a variable top of not less than 8.0" d.i.b. Scribner Rule.

Table 12. Net Annual Allowable Cut of Growing Stock by Species and Size Class of Timber (cords)
Chippewa National Forest

| Species | Total | Poletimber | Sawtimber |
|---|---|---|---|
| SOFTWOODS: | | | |
| White Pine | 5,344 | 692 | 4,652 |
| Red Pine | 8,014 | 1,622 | 6,392 |
| Jack Pine | 8,680 | 2,483 | 6,197 |
| Balsam Fir | 15,774 | 8,451 | 7,323 |
| White Spruce | 2,079 | 545 | 1,534 |
| Black Spruce | 2,263 | 1,668 | 595 |
| Tamarack | 2,290 | 1,758 | 532 |
| Cedar | 2,974 | 1,644 | 1,330 |
| Total | 47,418 | 18,863 | 28,555 |
| HARDWOODS: | | | |
| Sugar Maple | 1,071 | 554 | 517 |
| Yellow Birch | 327 | 78 | 249 |
| Oak | 3,895 | 2,274 | 1,621 |
| Basswood | 2,633 | 1,517 | 1,116 |
| Elm | 2,867 | 1,527 | 1,340 |
| Aspen | 72,912 | 54,102 | 18,810 |
| Balsam Poplar | 5,321 | 3,260 | 2,061 |
| Paper Birch | 17,127 | 13,864 | 3,263 |
| Red Maple | 888 | 771 | 117 |
| Ash | 4,184 | 3,011 | 1,173 |
| Total | 111,225 | 80,958 | 30,267 |
| All Species | 158,643 | 99,821 | 58,822 |

Table 13. Area of Timbered Commercial Forest Land by Forest Type and Timber Stand Improvement Needs

Chippewa National Forest

(Acres)

| Forest Type | Total | No Treatment | Weed or Thin | Cull Tree Removal or Liberation Cut |
|---|---|---|---|---|
| White Pine | 7,960 | 6,090 | 110 | 1,760 |
| Red Pine | 44,470 | 34,940 | 2,750 | 6,780 |
| Jack Pine | 28,580 | 24,420 | 1,810 | 2,350 |
| Spruce-fir | 12,950 | 11,130 | 430 | 1,440 |
| Black Spruce | 22,300 | 21,410 | 110 | 760 |
| Tamarack | 16,190 | 16,160 | | 30 |
| Swamp Conifers | 21,190 | 18,540 | 440 | 2,210 |
| Northern Hdwds. | 56,200 | 40,900 | 330 | 14,970 |
| Oak | 6,780 | 4,950 | | 1,830 |
| Lowland Hdwds. | 17,690 | 14,290 | | 3,400 |
| Aspen | 274,820 | 230,090 | 1,590 | 43,140 |
| Paper Birch | 15,930 | 14,040 | 640 | 1,250 |
| All Types | 525,060 | 436,960 | 8,210 | 79,920 |

Table 14. Total Number of Field Samples, and Total Volume and Sampling Error[1/] of Growing Stock and Sawtimber on Timbered Commercial Forest Area by Working Circles

Chippewa National Forest

| Working Circle | Number of Points | Total Growing Stock (M Cords) | Total Error (%) | Total Sawtimber (MMBM) | Total Error (%) |
|---|---|---|---|---|---|
| Bena | 953 | 649 | ± 9.4 | 77 | ± 20 |
| Blackduck | 512 | 442 | ± 8.3 | 36 | ± 17 |
| Cass Lake | 964 | 1,013 | ± 7.8 | 135 | ± 16 |
| Cut Foot Sioux | 938 | 1,032 | ± 5.8 | 152 | ± 10 |
| Dora Lake | 664 | 613 | ± 8.1 | 43 | ± 13 |
| Marcell | 895 | 1,049 | ± 6.2 | 92 | ± 23 |
| Remer | 794 | 588 | ± 10.5 | 28 | ± 28 |
| Walker | 374 | 459 | ± 10.9 | 46 | ± 21 |
| All | 6,094 | 5,845 | ± 2.9 | 609 | ± 7 |

1/ The true volume of growing stock on the Chippewa National Forest is within ± 2.9 percent or ± 169,500 cords of the estimated volume of 5,845,000 cords unless a 1 in 20 chance has occurred.

USFS TMP
Region 9 Plan 4

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